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therefore, is governed "by the varying balance of the meteorological conditions affecting the organisms." A table is given of twenty objects most commonly observed, showing the average date for each of the seven years. From these the normal date or phenochron of each species is computed, together with the phenological norm or phenochron of the entire list for each year. Other tables are given of objects selected from different counties and provinces. If observers are symmetrically placed over a county, are competent and careful, and put the same interpretation on what constitutes "first appearance" and "becoming common," the averages would give phenological norms for the comparison of a very important character of the country with that of another, and more especially the comparison of one season with another in the same country, which, after a series of years, would contribute to the solution of the problem of secular variation of climate.

In 1897 the idea was extensively taken up in the schools of Nova Scotia as a part of the prescribed course in nature study, the pupils themselves making the observations under the guidance of the teachers. Hundreds of reports were sent in from as many school districts. It is believed to be a convenient means for the stimulation of pupils in observing all natural phenomena while going to and from school.

H. C. IRISH.

**King's Irrigation and Drainage.** — The high standard of excellence already established in the Rural Science Series under the editorship of Professor L. H. Bailey is fully maintained in the latest volume.<sup>1</sup> Although this volume is quite complete in itself, it may be regarded, in a way, as supplementary to Professor King's work on soils, with which the series began. Like that, the present work is addressed primarily to practical farmers and agricultural students, but at the same time it contains much of value to all interested in the nutrition of plants.

In an introduction of sixty-five pages the author discusses with considerable fullness the importance of water to the plant, and details some noteworthy experiments carried on by him at the University of Wisconsin to determine the quantity of water used by cultivated plants in coming to perfection under ordinary field conditions. The data thus obtained for various crops figure in impor-

<sup>1</sup> King, F. H. *Irrigation and Drainage*: principles and practice of their cultured phases. New York, The Macmillan Company, 1899. 12mo, xxii + 502 pp., 163 illustrations.

tant ways throughout the book. Part I, on Irrigation Culture, opens with an account, historically developed, of The Extent and Geographical Range of Irrigation. Then follow chapters on The Conditions which make Irrigation Imperative, Desirable or Unnecessary, The Extent to which Tillage may take the Place of Irrigation, and The Increase of Yield due to Irrigation in Humid Climates; then several chapters regarding the practical management of water under various conditions, and finally a chapter on Sewage Irrigation. Part II deals with the principles and practice of Farm Drainage.

In almost every chapter one finds an immense amount of information clearly displayed in tabular form and often representing the results of the author's experimental contributions to the subject. Then, too, one gains confidence in the author's general statements from the evident fact that they are based upon wide personal observation of irrigation and drainage practice, both in this country and in Europe. The author champions no pet theory; he lets facts speak for themselves and lead the way to broad principles of practical value.

The illustrations, largely reproductions from photographs, are, for the most part, of unusual excellence, and so reproduced as to show clearly the features intended to be seen.

F. L. S.

**Trimen's Flora of Ceylon.**<sup>1</sup> — Seven years ago, Professor Trimen, then director of the Royal Botanic Gardens of Ceylon, began the publication of a manual of the plants of that important island, which has now been brought to a conclusion in the fifth "part," or volume. The author lived to bring out only the first three volumes, and the other two have been seen through the press by Sir Joseph Hooker. To the concluding volume are appended a key to the orders, genera, and aberrant species of Ceylon flowering plants, with diagnostic characters of the orders; a chapter on the forests and waste lands of Ceylon, by A. F. Broun; a chapter on the distribution of the rainfall in Ceylon, by F. Lewis; a history of Ceylon botany, by G. S. Boulger; a table of corrections; and comprehensive indices to the entire work.

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<sup>1</sup> *A Hand-Book to the Flora of Ceylon.* Containing descriptions of all the species of flowering plants indigenous to the island, and notes on their history, distribution, and uses. By Henry Trimen. Continued by Sir J. D. Hooker. London, Dulau & Co., 1893-1900. 5 vols., 8vo.